



Nuclear Knowledge Management @ Ispra

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Institute for the Protection and the Security of the Citizen

PAC 5 KM Kick-Off- Karlsruhe
13 November 2008

Overview

	Information Systems / Databases	Knowledge Capture, Conservation & Dissemination	Training & Education	Tools
REM, IES	REM DB, ECURIE, EURDEP	SKM, PUBSY, AIRDOS	Customer Training	
NUSAF, IPSC	NUMAS, IAC	SKM, PUBSY, ESARDA	ESARDA Customer Training (IAEA, TREN inspectors), TACIS	SIT-ES, Information Management for NPT studies, EMM, STRESA

Nuclear Knowledge Management @ IES

Radioactivity Environmental Monitoring

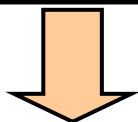


AL: Marc De Cort

<http://rem.jrc.ec.europa.eu>

Main objectives/legal background

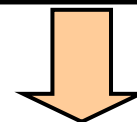
Exchange, intercomparison and handling of environmental radioactivity information in routine (Euratom art 36) and in emergency (CD 87/600) conditions and the analysis of the significance of the information collected.



Data/information exchange

TL: Gerhard de Vries

ECURIE
EURDEP



Modelling

TL: Stefano Galmarini

ENSEMBLE

Customer DG: TREN H.4

Data exchange/handling activities

Development and maintenance of systems for transfer, storage, evaluation and reporting of environmental radioactivity data in routine (art 36 - Euratom Treaty) and in emergency conditions (Council Decision 87/600)

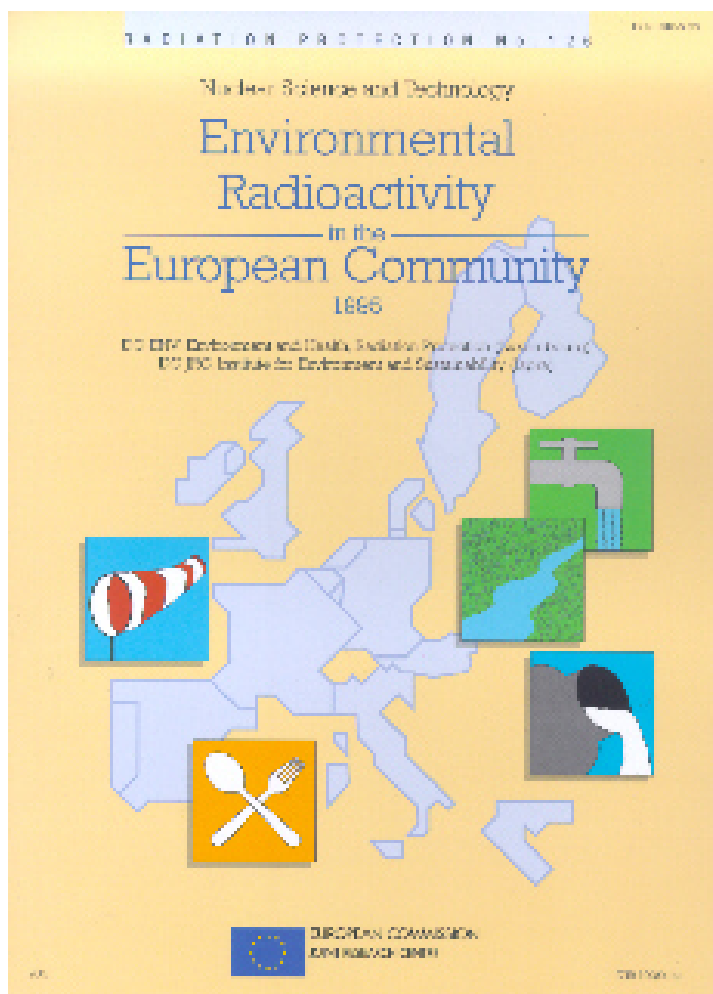
REM db: European radioactivity data in air, soil, water, food from 1984 onwards (at <http://rem.jrc.ec.europa.eu>)

ECURIE: nuclear emergency information exchange system (EC<>EU27 + CH + HR) with IAEA

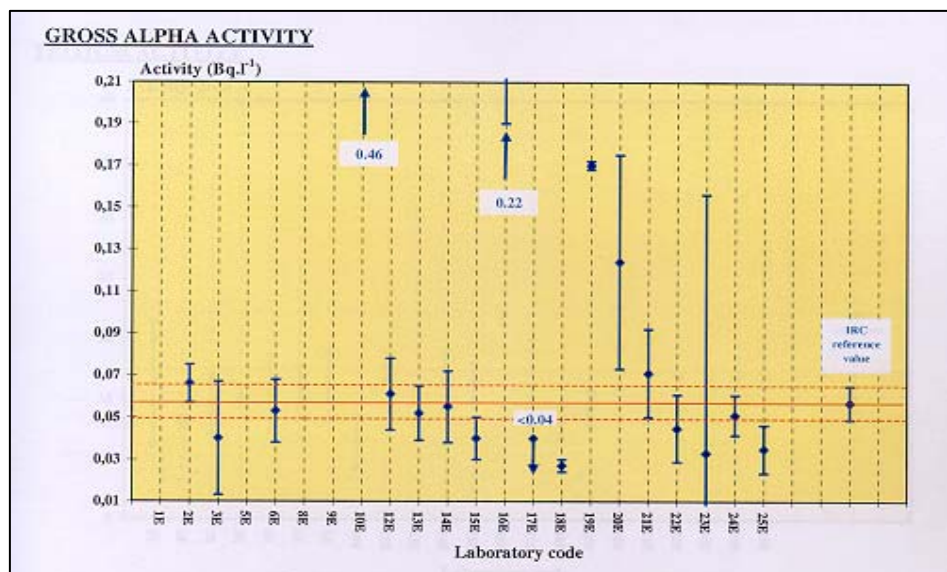
EURDEP: daily exchange of radioactivity measurements with 33 European countries

Collaboration with > 80 international institutions in EU and worldwide

REM db + reporting:



- REMdb: > 1.8 M records from 1984 onwards
- Standardisation of data-input
- input processing software (REM Data Submission Tool) and reporting software under development
- Two-yearly art35/36 experts meetings (EC+EU27)
- international inter-comparison exercises (IRMM)



ECURIE – CURRENT STATUS

- Early Notification system for Nuclear accidents, based on 87/600 Council Decision;
- 29 Contact Points (EU27 + CH + HR)
- Transmission of Early Notifications and subsequent Information
- Notifications are created, sent and received by the CoDecS software in use at the CP's and CA's;
- Developed by REM, operated by DG TREN H.4 in Luxembourg.
- <http://rem.jrc.ec.europa.eu>

ECURIE CoDecS Version 1.3 - Build: 2004.11.07

Message Folder Edit View Settings Options Help

2008-03-18 14:48 UTC

Received Sent Outbox Draft Template

Att...	Orig...	Errors	Accident seq. nr.	Date	Type	Level	Originator	Serial Nr.	Comment
			XX,XXXX,A,001	2005-07-27 12:29	Initial Not.	3	XX,XXXX	1500	
			LU,PROTEX LU,E...	2005-10-11 08:01	Initial Not.	3			
			LU,EC ENV C.4,A...	2004-04-28 07:38	Notification	3	IT,EC-JRC,0073		
			LU,EC ENV C.4,A...	2004-04-28 07:36	Notification	3	IT,EC-JRC,0072		
			IT,NONE,001	2004-08-24 15:41	Notification	Alarm	IT,NONE,0005		
			IT,JRC-TEST,A,001	2005-05-20 09:34	Initial Not.	Alarm			Duplicate Message
			IT,JRC-TEST,A,001	2005-05-20 09:36	Initial Not.	Non E...			
			IT,JRC-TEST,A,001	2005-05-27 09:54	Initial Not.	Alarm			
			IT,JRC-TEST,A,001	2005-05-27 10:22	Initial Not.	Alarm			
			IT,JRC-TEST,A,001	2005-05-27 10:39	Initial Not.	Alarm			
			IT,JRC-TEST,A,001	2005-05-31 07:10	Initial Not.	Alarm			
			IT,JRC-TEST,A,001	2005-05-31 07:28	Initial Not.	Alarm			
			IT,JRC-TEST,A,001	2006-08-23 12:24	Initial Not.	3			
			IT,JRC,A,025	2004-09-10 03:18	Notification	3	IT,JRC,0079		

Accident details

Date: (010) 2001-03-05 06:00

Country: (011) LUXEMBOURG

Location: (014) 60°15'N,060°20'E

Nature: (020) 03-nuclear reactor in space

Severity - INES: (022) 4

Start of release: (025) 2001-03-05 07:30

Type of release: (027) 1-Release is (likely to be) to the atmosphere

Monitoring results available: (500) No

Protective measures: (600) 1-taken

Trajectory forecasts available: (320) No

Development: (024) 3-deteriorating

Message details

Accident Sequence Nr.: LU,EC ENV C.4,A,021

Class/level: ECURIE EXERCISE / 3

Type of Msg: Notification

From: ITALY / JRC-pers.station

Transmission: Lan SMTP

Attachment: 1 Attachment(s)

Errors: 0

Dig.Sign.: 0

Originator: 0

Go to Forwarded

Status area

Nr. of messages: 293 6263

Last message: 2008-02-29 08:13

Unread messages: 16

Network: 0 1 2 3 I A E N !

ISDN: 0 1 2 3 I A E N !

Out Directory: 0 1 2 3 I A E N !

In Directory: 0 1 2 3 I A E N !

TelexBox: 0 1 2 3 I A E N !

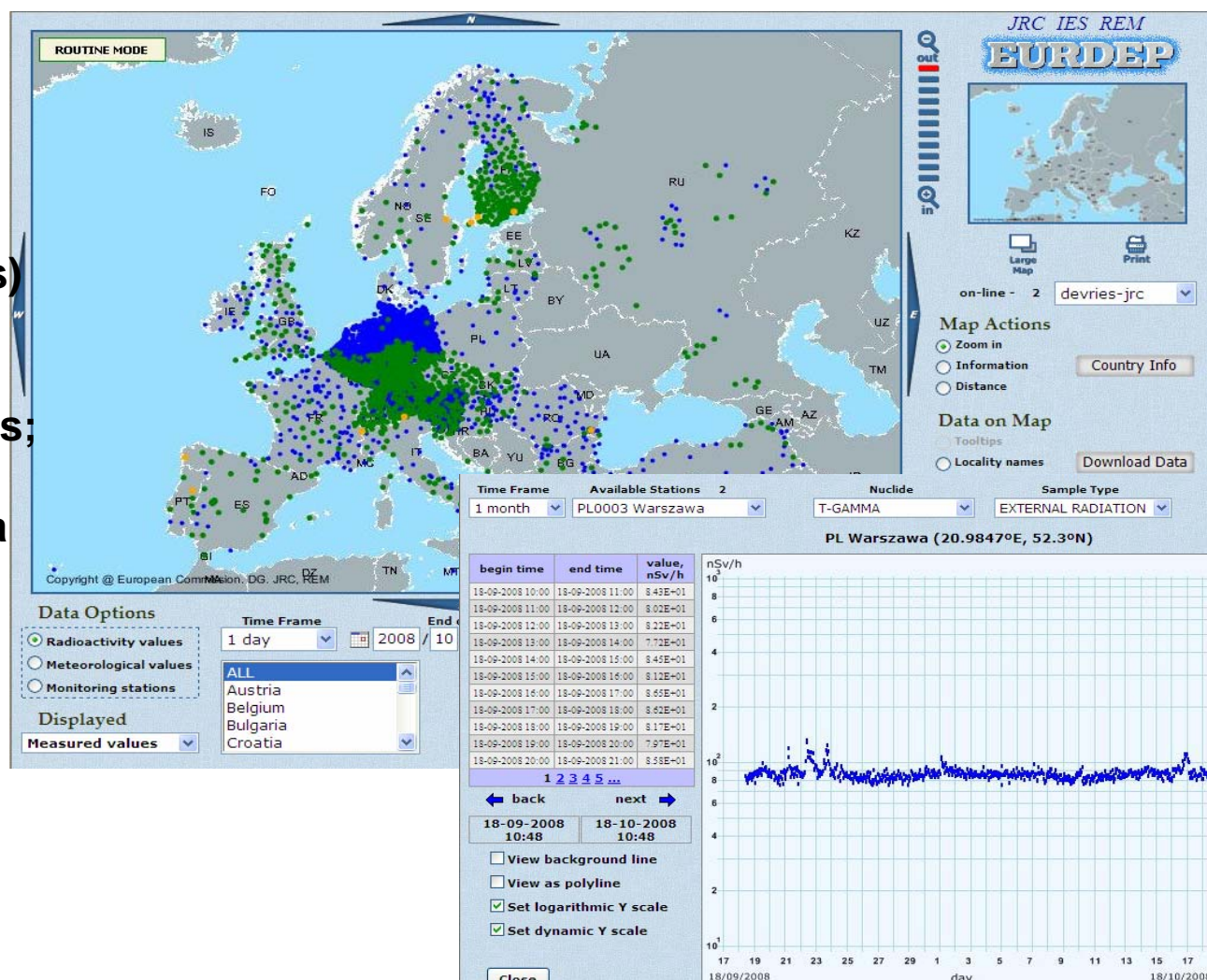
AlarmBox: 0 1 2 3 I A E N !

Diskspace in use: 74 %

EURDEP - On-line data base - WWW

- Internationally recognized standard format for radiological data;
- Network (33 European countries participate);
- Routine (daily transmissions) and emergency (hourly transmissions) mode;
- Currently mostly γ -dose rates;
- Data-exchange by pulling (mirroring) and pushing data using FTP;
- Web-site to view and download data.

<http://eurdep.jrc.ec.europa.eu>



AIRDOS: summary

Aim

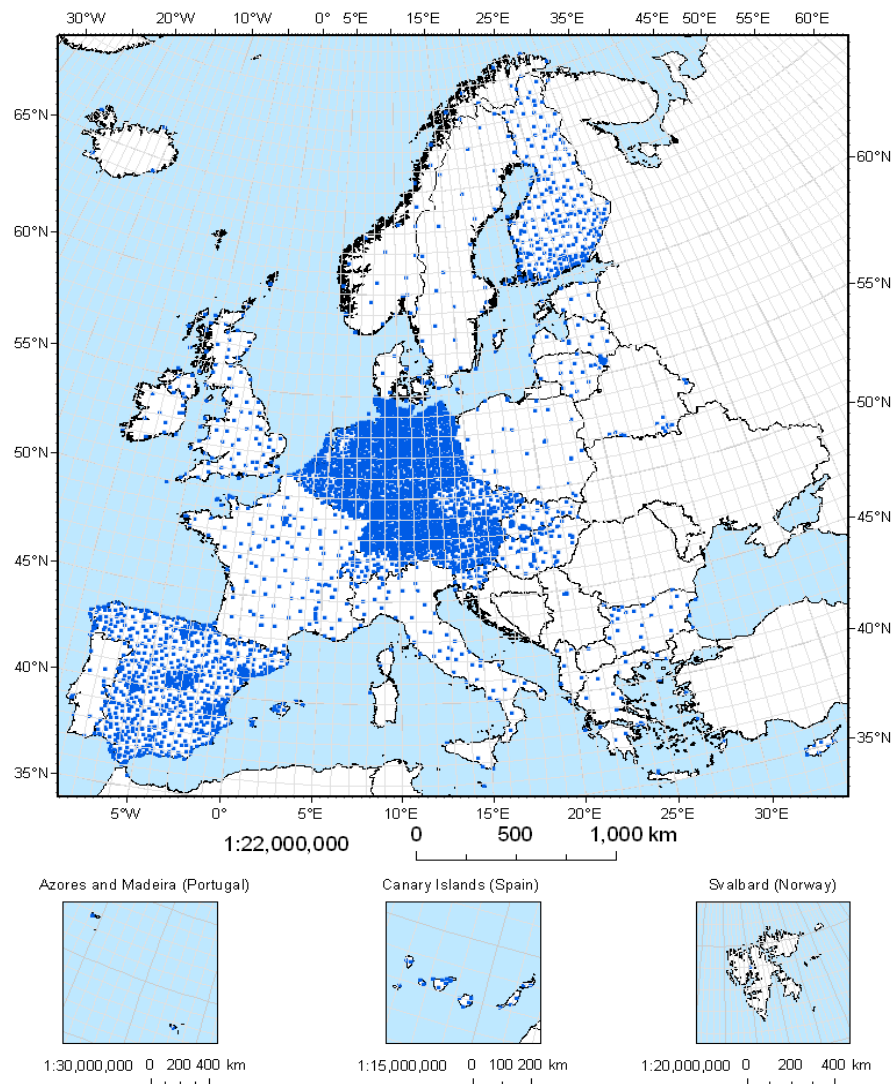
- Inventory of national networks in Europe on gamma dose rate and aerosol (on-line/off-line) measurements
- Identify the differences
- Suggest how to improve the harmonisation at European level

Current status

- Information from 33 countries evaluated
- 7 additional countries contacted
- Finalisation of report as input to Commission Recommendation

Future development

- Link the information to EURDEP
- Develop protocol to update the information



Nuclear Knowledge Management @ IPSC

- Inspector Tools / Safeguards Analytical Measurements
- ESARDA Safeguards and Non-Proliferation Training Course
- Non-Proliferation Assessment / Country profiles



2008 ESARDA COURSE
Nuclear Safeguards & Non Proliferation
14-18 April 2008, EC – JRC Ispra, Italy




Mass/volume methodology and tank calibration	Twice/yr	EURATOM/ IAEA
Solution monitoring and evaluation systems	Once/yr	EURATOM/ IAEA
NDA basic physics	Once/yr	EURATOM/ IAEA
U enrichment determination by gamma-ray spectrometry	Twice/yr	EURATOM/ IAEA
Pu isotopic composition by gamma-ray spectrometry	Twice/yr	EURATOM/ IAEA
Active neutron interrogation	Twice/yr	EURATOM/ IAEA
Passive neutron assay	Twice/yr	EURATOM/ IAEA
Pu physical inventory verification	Once/yr	EURATOM/ IAEA
Advanced hands-on RADAR/ CRISP/ XSEAT	Once/yr	EURATOM
3D-Laser based design information verification	Twice/yr	IAEA
Satellite Imagery of nuclear installations (organised by EUSC in Torrejon)	Twice/yr	EUSC/ Intellig. services
Nuclear Science with NUCLEONICA	Twice/yr	Nucl. ind./ Res. centr./ Uni.
<i>Complementary Access Exercise</i>	<i>Once/yr</i>	<i>IAEA (restricted!)</i>
<i>Advanced NDA training</i>	<i>Once/yr</i>	<i>IAEA</i>

- Collaboration with both IAEA and DG TREN
- First course, Ispra 03/07
- 3 teams of 4 inspectors

- Complementary access
 - spent fuel pond
 - reactor
 - hot cells
 - tritium laboratory



- The training allows to test and improve the **investigative skills** and to focus on the **observational, communication, negotiating, and team building skills** currently required of nuclear inspectors in the detection of **undeclared activities**.

Monday, 14 March 2008	Tuesday, 15 April 2008	Wednesday, 16 April 2008	Thursday, 17 April 2008	Friday, 18 April 2008
8:30 Introduction (Janssens)	8:30 Nuclear material account.& control principles (Burrows)	8:30 non-destructive assay: neutron detectors (Peerani)	8:30 Import/ Export control (Tarwainen)	9:00 Reduction & Elimination of Fissile Materials (Sokova)
9:45 Nuclear material subject to safeguards (Maenhout)	9:45 Auditing an accountancy: statistics (Franklin)	9:45 non-destructive assay: γ -spectrometers (Berndt)	9:45 Information collection and analysis (Baute)	9:45 Physical Protection (Dickmann)
11:00 Coffee Break	11:00 Coffee Break	11:00 Coffee Break	11:00 Coffee Break	11:00 Coffee Break
11:15 The nuclear fuel cycle (Grenèche)	11:15 Group Exercise: how verify region (Hunt)	11:15 Destructive analysis (mass spectrometers, ...) (Aregbe)	11:15 Extending the NPT with AP (Rockwood) + introduction group exercise	11:15 Nuclear trade regulations in EU (Michel) + introduction group exercise
12:30 Lunch (JRC buffet)	12:30 Lunch (JRC buffet)	12:30 Lunch (JRC buffet)	12:30 Lunch (JRC buffet)	12:30 Lunch (JRC buffet)
13:30 Visit to Lab1	13:30 Visit to Lab2	13:30 Visit to Lab3	13:30 Visit to Lab4	13:30 Visit to Lab5
14:45 History of Non Proliferation (Jonter)	14:45 Monitoring & Containment/Surveillance (Funk)	14:45 Nuclear forensics (Mayer)	14:45 Proliferation and control: impact for industry (Jorant)	14:45 How to combat illicit trafficking (Hoskins)
16:00 Coffee Break	16:00 Coffee Break	16:00 Coffee Break	16:30 Coffee break	16:30 Coffee break
16:15 Overview treaties (Jankowitsch-Prevor)	16:15 Inspections on site: verify inventory (Schwalbach)	16:15 Environmental monitoring (Kalinowski)	16:45 Presentation of group exercise (Rockwood)	16:45 Presentation of group exercise (Michel)
17:30 Wrap-up	17:30 Presentation of Group exercise (Hunt)	17:30 Wrap-up	18:00 Wrap-up	18:00 Conclusion + attendance certificate
18:30 Opening Cocktail	http://npns.jrc.it/frameset.html		18:30 Course Cocktail with lecture: Iraq case study (Baute)	

ESARDA: European Safeguards Research and Development Association

- Network of organisations which includes
 - national regulatory authorities (carrying out the controls),
 - operators of nuclear facilities (those being controlled),
 - research centres (carrying out the safeguards-related R&D).
- More than 25 members from 14 countries plus the Commission. More than 10 members joined during the last 3 years.

• ESARDA main community with efficiency of new technologies progress and safeguards can technical body this network an



objective is to assist the European safeguards the advancement of safeguards, enhancing the systems and measures. It also investigates how can be developed and implemented so that continuous improvement in international be achieved efficiently. ESARDA is a unique working in a political environment. This makes extraordinary tool for the use of its members.

- ESARDA was created in 1969.

Working Groups

Working Groups are established to promote and undertake collaborative R&D and information exchange activities in numerous fields. The WG activities are performed by more than 100 experts (members or observers of ESARDA).

Working Groups:

- technical fields
 - Destructive Assay (DA)
 - Non Destructive Assay (NDA)
 - Containment / Surveillance (C/S)
- plant oriented
 - Fuel Fabrication plants (FFP)
- system oriented
 - Integrated Safeguards (IS): preparation and implementation of Additional Protocol in Member States facilities
 - NMACAF: preparation of European Commission new approaches
 - Verification technologies and methodologies (VTM)
- yearly European course in nuclear safeguards (TKM); attendance of 40-60 trainees from all over EU and abroad. Recognition by universities on going.
- Editorial Committee in charge of the implementation of ESARDA communication policy

ESARDA WG on Training & Knowledge Management

Objectives

- Common courses modules on safeguards and non proliferation
- Integration into ENEN network
- Elaboration the didactical material

Characteristics of the WG action

- Established by safeguards experts, with the ESARDA blessing
- Guidelines (of good practices) for teaching
- Distribution of the didactical material to the EU universities (controlled distribution)

ESARDA Library

Free access to

- Non-Proliferation Treaties
- Glossary
- Technical Sheets
- ESARDA Course Information
- ESARDA Bulletins
- ESARDA Proceedings

ESARDA approach to Knowledge Management

The approach consists of presenting a gradual didactic material on the website:

- The **glossary** that defines in a few words concepts, equipment, methods etc.
- The **Technical Sheets** that describe in a few pages the techniques used, their physical principle and their application fields;
- The **ESARDA course** that gives young professionals or students in nuclear engineering, the basics for understanding and using the safeguards concepts and technologies.

ISSUE	EVERYDAY EXAMPLE	ESARDA RESPONSE
Definition of a word; verification of its sense	The pocket Oxford dictionary	ESARDA Glossary
Explanation of a technique; scientific principles	Encyclopaedia Britannica	Technical Sheets
Development, detailed description of concept, technique and implementation; history	Specialised literature	Course modules

ESARDA: conferences and Workshops

- **Conferences and workshops:** open symposia alternating with internal meetings; about 200-250 participants;
- Last **symposium** in Aix en Provence from 22 to 24 May 2007
 - 260 participants
 - More than 170 papers have been submitted
 - 30 working sessions have been organised
 - Working Groups regular meetings
 - 6 side meetings (sub group of the AQG of the Council, IAEA, EC - US DoE, INMM etc.)
- **Internal meetings:** organised every other year in Luxembourg with enhanced participation of Euratom inspectors (about 150-200 participants)
- Proceedings are published shortly after the event. Material published is available on the website



ESARDA Bulletin and publications

ESARDA Website

Leaflet of presentation



- **ESARDA Bulletin**

Released twice a year; special issues are also published according to the actuality;

Peer reviewed articles in dedicated section since 2006;

Nearly 1000 recipients;

Liaison publication between the ESARDA / safeguards community members

- **ESARDA website**

Contains general and reference information;

Symposia, Working Groups and Bulletin have a dedicated page each;

Didactical section on treaties, glossary and Technical Sheets;

Data base of all ESARDA publications (nearly 3000 articles) is publicly accessible;
more than 1000 monthly visits.



<http://www.jrc.cec.eu.int/esarda>

Geographical Information Systems

Geographical Information Systems (GIS) are suitable tools to satisfy the needs of a safeguards information system:

- Geodatabase integrates spatial information (vector or raster)
- Supports non-spatial data as attributes or links
- Map-based interface supports intuitive analysis of spatial information
- The interface is a Geoportal that points the user to specialized applications

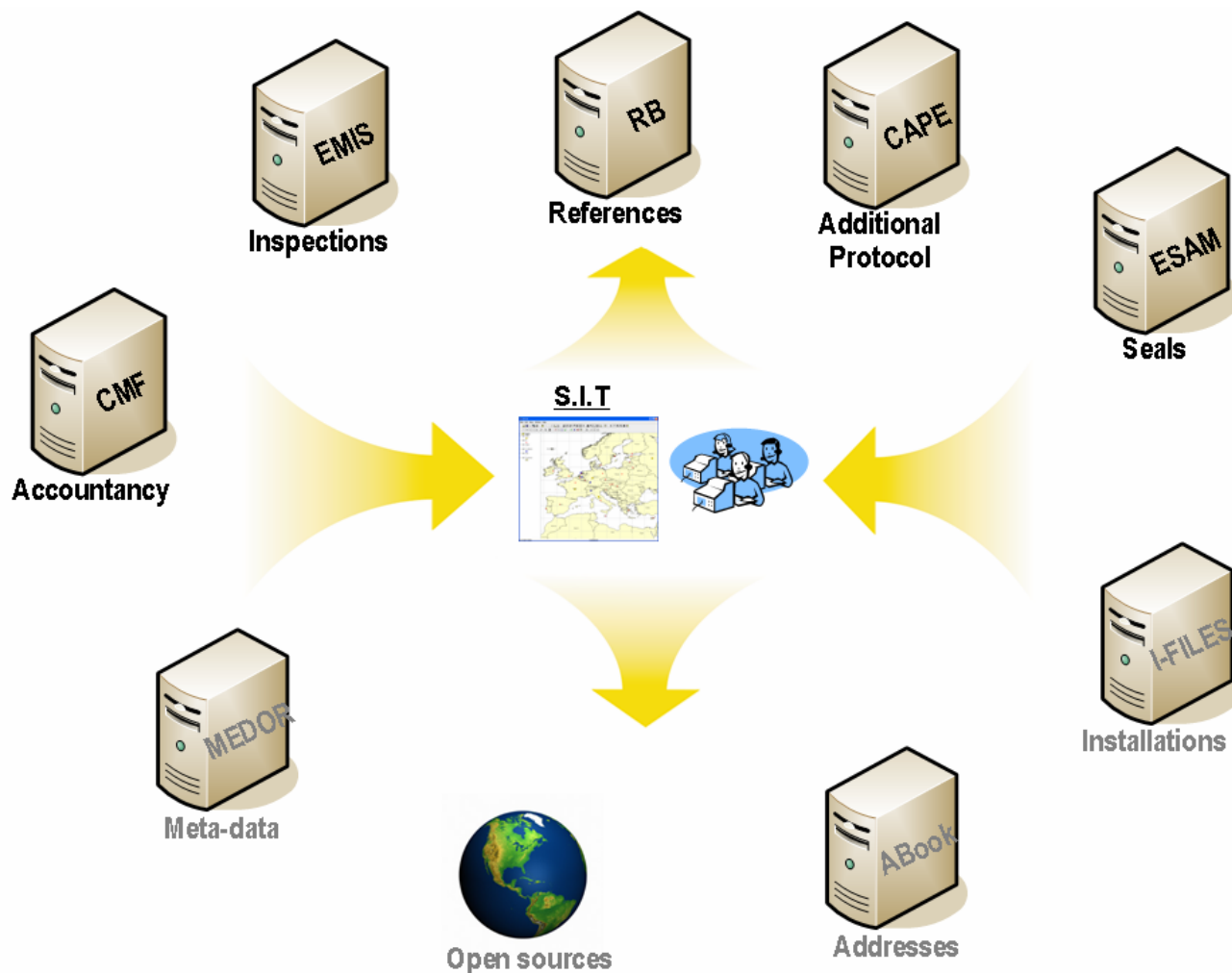
Early Developments: SIT & NUMAS

- **Nuclear Mapping System (NUMAS):** Mapping of world-wide nuclear facilities containing geographic coordinates and relevant attribute information.
- **Site Information Tool (SIT):** GIS-based tool for the management of AP declarations. Consists of three applications for the declaration (SIT-D) and verification (SIT-V) of AP declaration and for the on-site use by the inspector (SIT-I).
- Both systems are demonstrators based on single-user database and commercial GIS products. Data is updated and maintained locally.

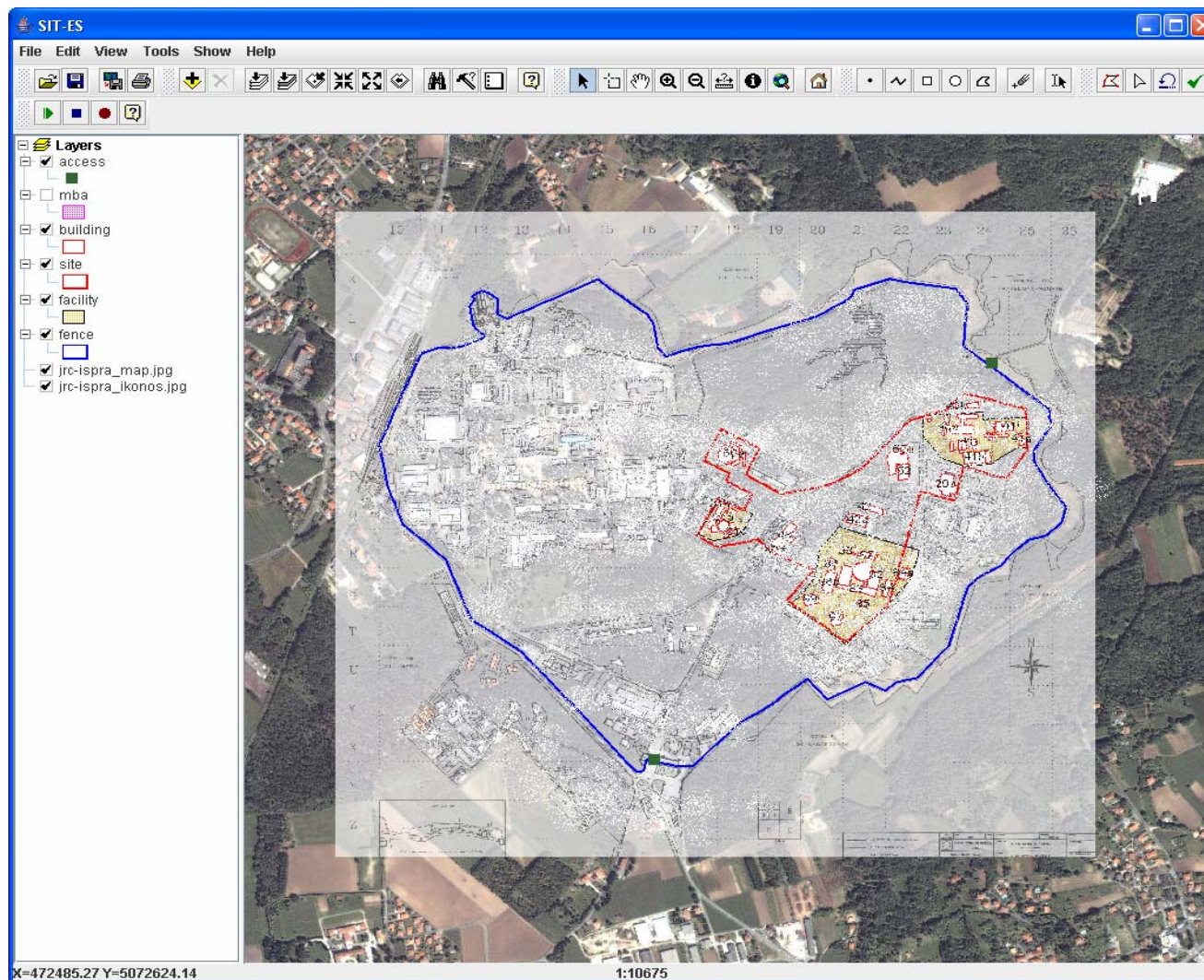
Site Information Tool – European Safeguards (SIT-ES)

- Support to European Commission DG-TREN to manage Safeguards related information
- Integration of existing data at DG-TREN HQ, Luxembourg
- Single point of access to multiple applications
- Geographical front-end mapping Safeguards entities (installations, buildings, mines, research activities, etc)
- Multiple level of details (country level to building level)
- Supports different user roles (read/write or read only)

SIT-ES Architecture



SIT-ES Example



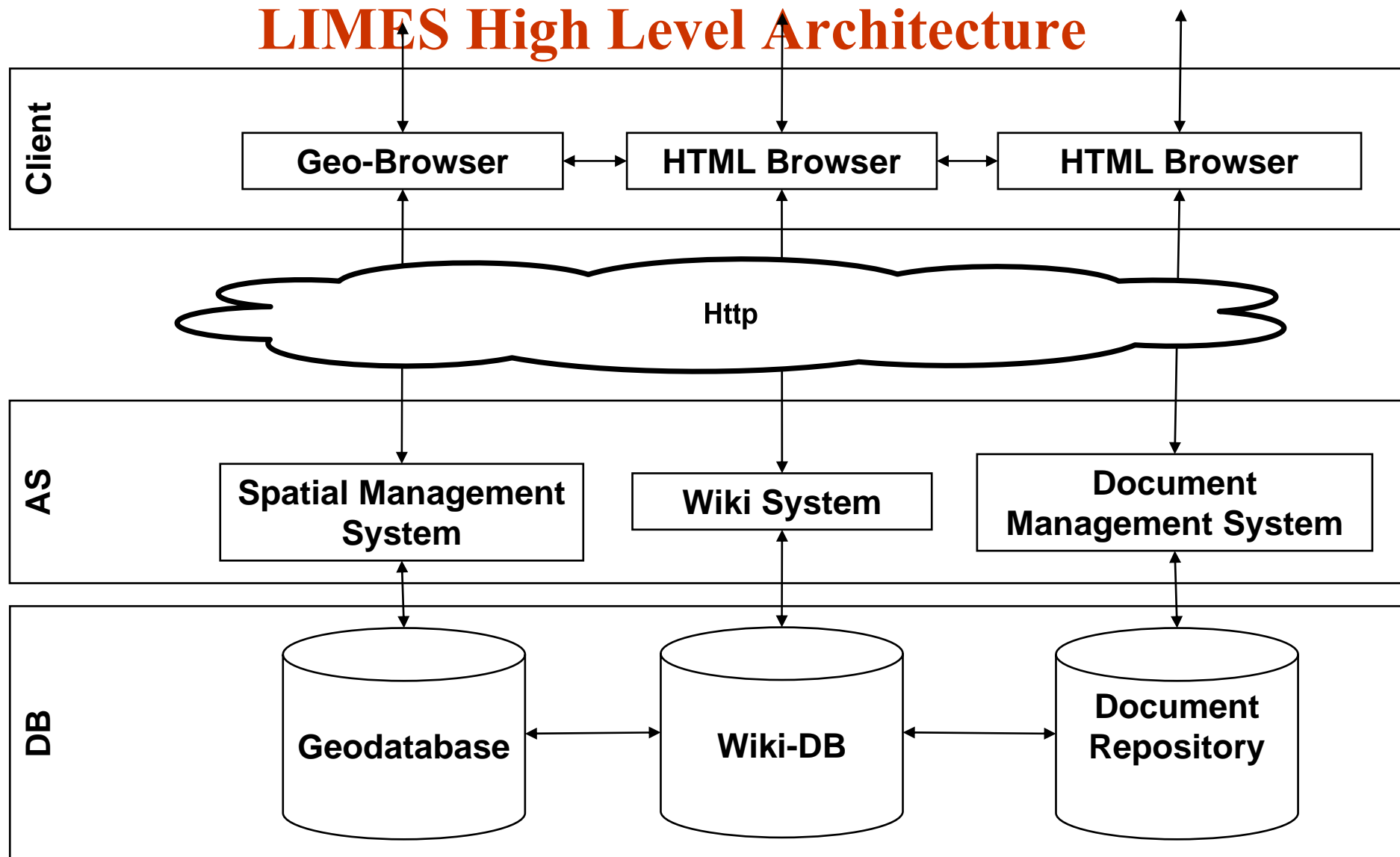
LIMES Scope:

Make easier the life of the Non-Proliferation analyst

Technical Objectives:

- Management
 - Integration
 - Retrieval
 - Visualization
 - Archiving
- of
- Geospatial Information
(vector, raster, 3D)
 - Non-spatial Information
(documents, collateral, knowledge)

LIMES High Level Architecture



LIMES Implementation

The demonstrator uses **Open Source Software** components, which are based on industry standards. As such they can be replaced with other Open Source/COTS products. Our current configuration is:

- **Single RDBMS** for all applications (PostGres/PostGIS)
- Java application server (**J2EE**) for GeoDB (Tomcat).
- **Geobrowser** (KML) for GeoDB front-end (Google Earth)
- **MediaWiki** for Wiki (uses PHP).
- **Alfresco** for Document Management System (uses J2EE)

LIMES Features

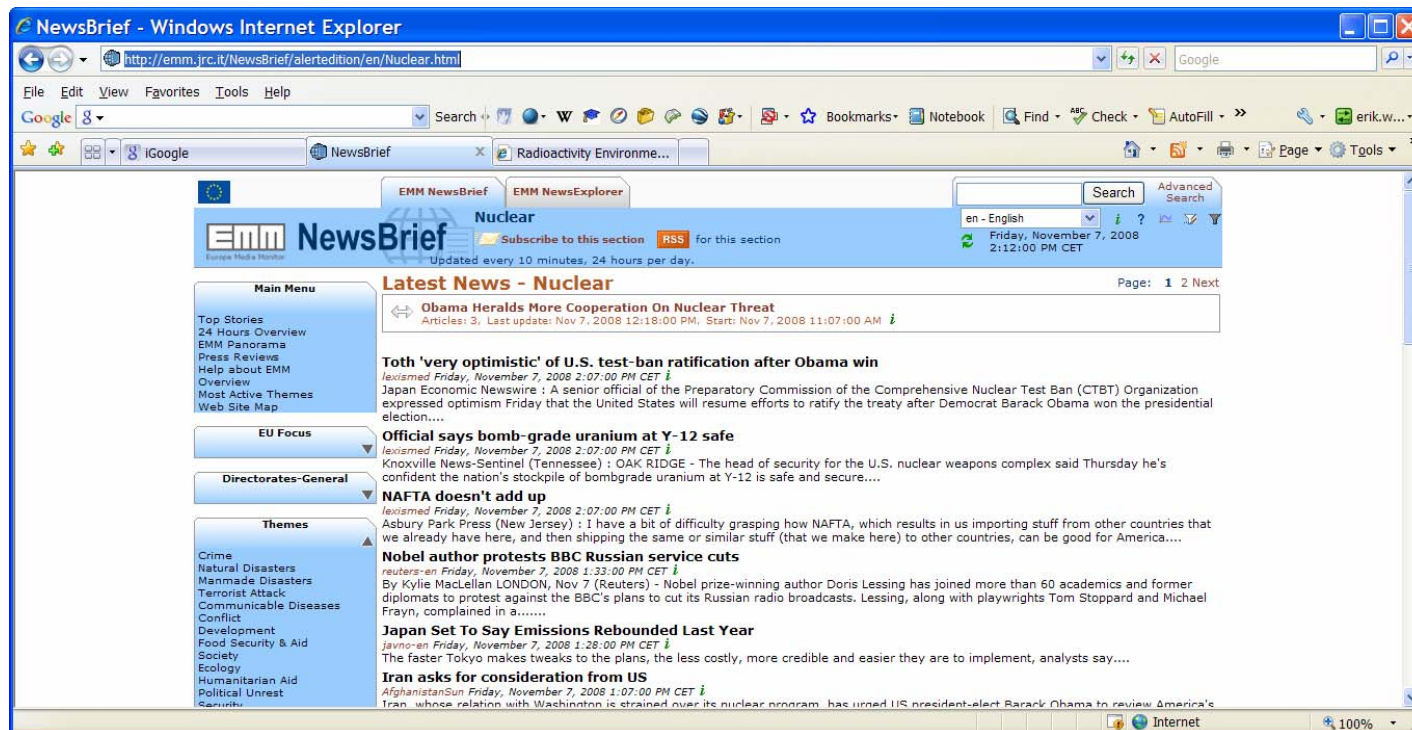
- Flexible, general-purpose (database) architecture
 - + adaptable to specific organization requirements
 - + adaptable to a range of purposes and target user profiles
 - requires well-defined workflow & best practices
- Favours collaboration and knowledge sharing → different user-roles can be defined
- Based on standard three-tier technology → existing security schemes can be applied on all levels (i.e. DB, AS, client)
- Current developments are based on popular Open-Source components → low cost, low risk

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European Media Monitor (EMM)

Gathers reports from news portals in 43 languages, classifies the articles, analyses the news texts by extracting information from them, aggregates the information, issues alerts and produces intuitive visual presentations of the information found.



Conclusion

What is existing

- Different information systems/databases containing nuclear-related data and information
- Activities for the general knowledge preservation and dissemination, e.g. in **nuclear safeguards** through ESARDA and other networking activities.
- Tools for information collection, management and archiving

What is not existing

- A dedicated strategy for internal knowledge capture and preservation (beyond JRC-wide tools like SKM and PUBSY)